

Part 1 -- Claims

1. (Currently Amended) A varactor comprising:
  - a diode junction;
  - a depletion region adjacent to the diode junction; and
  - a doped region beginning at the diode junction, including the
- 5 depletion region and having a nonuniform dopant concentration profile that continuously increases with increasing depth of the doped region starting from the diode junction and continuing to a peak concentration region at the deepest portion of the doped region;
- and wherein the continuously increasing nonuniform dopant
- 10 concentration profile causes the varactor to have an approximately linear capacitance/voltage response characteristic.
2. Canceled
3. (Previously Amended) A varactor as defined in claim 1 wherein:
  - the nonuniform dopant concentration profile is defined by an
  - equation  $N=Bx\exp(m)$ , where N is the dopant concentration, x is the depth of the
  - doped region, B is a concentration constant and m is an exponent that determines
  - 5 the degree of curvature of the dopant profile, and m is greater than 1.
4. Canceled
5. (Original) A varactor as defined in claim 3 wherein m is about 3.
6. (Previously Amended) A varactor as defined in claim 3 wherein:
  - B is in a range from about  $1.0E13/\text{cm}^3$  to about  $1.0E19/\text{cm}^3$ ; and
  - m is greater than one.
7. (Original) A varactor as defined in claim 6 wherein B is about  $1.0E16/\text{cm}^3$ .
- 8.-10. Canceled

11. (Withdrawn) A method of forming a varactor in a semiconductor substrate comprising:
- forming a first doped region of a first dopant type with a nonuniform dopant concentration profile from a low-doped end of the first doped region to a
  - 5 high-doped end of the first doped region;
  - forming a second doped region of a second dopant type adjacent the low-doped end of the first doped region;
  - forming a diode junction between the first and second doped regions;
  - forming a depletion region in the first doped region adjacent the
  - 10 second doped region by reverse biasing the diode junction; and
  - establishing a capacitance between the first and second doped regions that is approximately linearly related to the reverse biasing.
12. (Withdrawn) A method as defined in claim 11 further comprising:
- forming a conductive path to and from the varactor through the high-doped end of the first doped region.
13. (Withdrawn) A method as defined in claim 11 further comprising:
- forming the first doped region with the nonuniform dopant concentration profile defined by an equation  $N=Bx^m$ , where  $N$  is the dopant concentration,  $x$  is the depth of the doped region,  $B$  is a concentration constant
  - 5 and  $m$  is an exponent that determines a degree of curvature of the nonuniform dopant concentration profile.
14. (Withdrawn) A method as defined in claim 13 wherein  $m$  is greater than zero.
15. (Withdrawn) A method as defined in claim 13 wherein  $m$  is about 3.
16. (Withdrawn) A method as defined in claim 13 wherein:
- $B$  is in a range from about  $1.0E13/cm^3$  to about  $1.0E19/cm^3$ ; and
  - $m$  is greater than zero.

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17. (Withdrawn) A method as defined in claim 16 wherein B is about  $1.0E16/cm^3$ .